

Community Solar

PROGRAM DESIGN MODELS



Produced By SEPA in conjunction with Solar Market Pathways



EXECUTIVE SUMMARY

Solar Electric Power Association considers utility-involved community solar a business model with three defining elements:

- 1. a group of participants voluntarily pay for a share of a solar array that is located external to their properties;**
- 2. the electricity produced flows into the electric grid; and**
- 3. the subscribers receive benefits for the electricity produced by their share of the solar array.**

The value of community solar programs to a utility's customers is significant.

Through utility-involved community solar, customers who are interested in renewable ownership, but lack rooftops ideally suited for rooftop photovoltaic (PV) solar, are able not only to participate but also to benefit from the economies of scale, with no maintenance associated with an offsite solar build. From the utility perspective, community solar helps improve a utility's relationships with customers and gives the utility more control over new distributed generation projects.

In this report, funded by the U.S. Department of Energy via the Solar Market Pathways grant, SEPA aims to improve the public understanding of what community solar design models currently exist. This report breaks down program design into 12 key decisions and provides discussion as to what options are most prevalent, and their resulting consequences. In addition, the report provides insight into subscription rates, development times, and administrative costs of current programs.

This report is the first step in a larger process that has the overall goal of increasing the prevalence of community solar. The next two steps in this process are to conduct market research to identify what customers want in a community solar program, and then to work with individual utilities to help structure new community solar programs that best meet the utilities' and their customers' needs.

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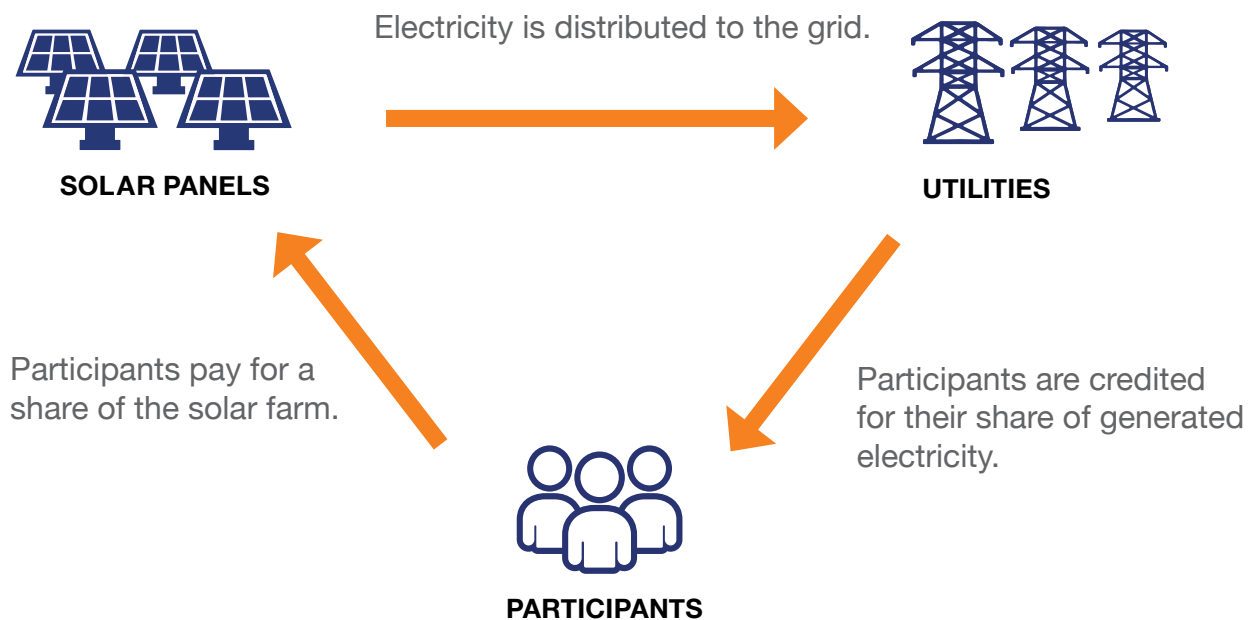
SECTION 1: INTRODUCTION

Solar Market Pathways

In 2014, the U.S. Department of Energy (DOE) SunShot Initiative announced the Solar Market Pathways (SMP) funding opportunity. Applicants were instructed to develop actionable plans that would expand solar generation and support SunShot's programmatic goal – to make solar energy fully cost-competitive with traditional energy sources by 2020. SMP supports 15 SunShot projects dealing with a variety of solar topics, including grid resiliency, solar-plus-storage, low-income access to solar, and community solar.

The last of these, community solar, is the topic of the Solar Electric Power Association's (SEPA's) SunShot award, "Community Solar Design Models for Consumer, Industry & Utility Success." SEPA's project aims to spark the continued growth of community solar models that are closely aligned with the needs and interests of consumers, utilities, and other stakeholders.

FIGURE 1. COMMUNITY SOLAR PROGRAM SCHEMATIC

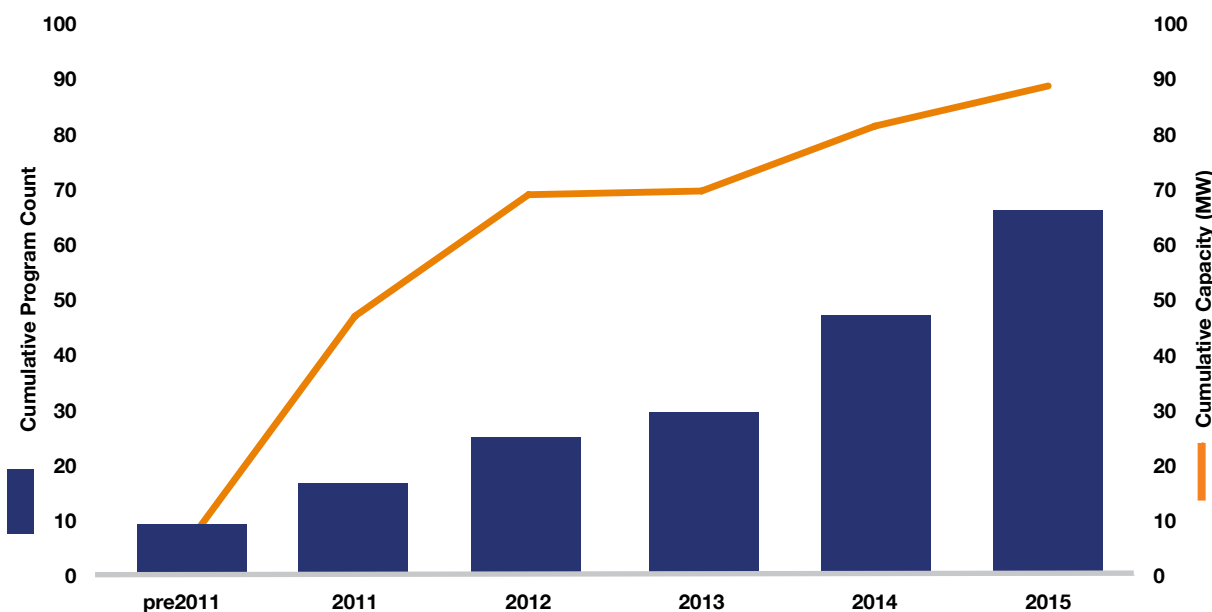


Community Solar Basics

In this report, SEPA uses the term community solar program (CSP) to describe a specific business model. SEPA uses the term community solar garden (CSG) to describe a single solar array used in the program. An individual CSP will be located in one utility's service territory and will have consistent terms and conditions, but may involve multiple CSGs.

SEPA considers all CSPs to share three defining transactions as depicted in Figure 1. First, a group of participants voluntarily pay for a subscription (or direct ownership) of a portion of a CSG that is located off-site. Second, the electricity produced by the CSG flows directly into the grid. Third, in exchange for their subscription, the participants receive an agreed upon compensation (e.g., an on-bill credit) for the electric production of their portion of the solar CSG. CSPs can be led directly and entirely by the utility, led by the utility in partnership with a third party serving a specific role (e.g., project developer, customer interface), or even led by a third party.

FIGURE 2. GROWTH OF COMMUNITY SOLAR PROGRAMS & GENERATION CAPACITY



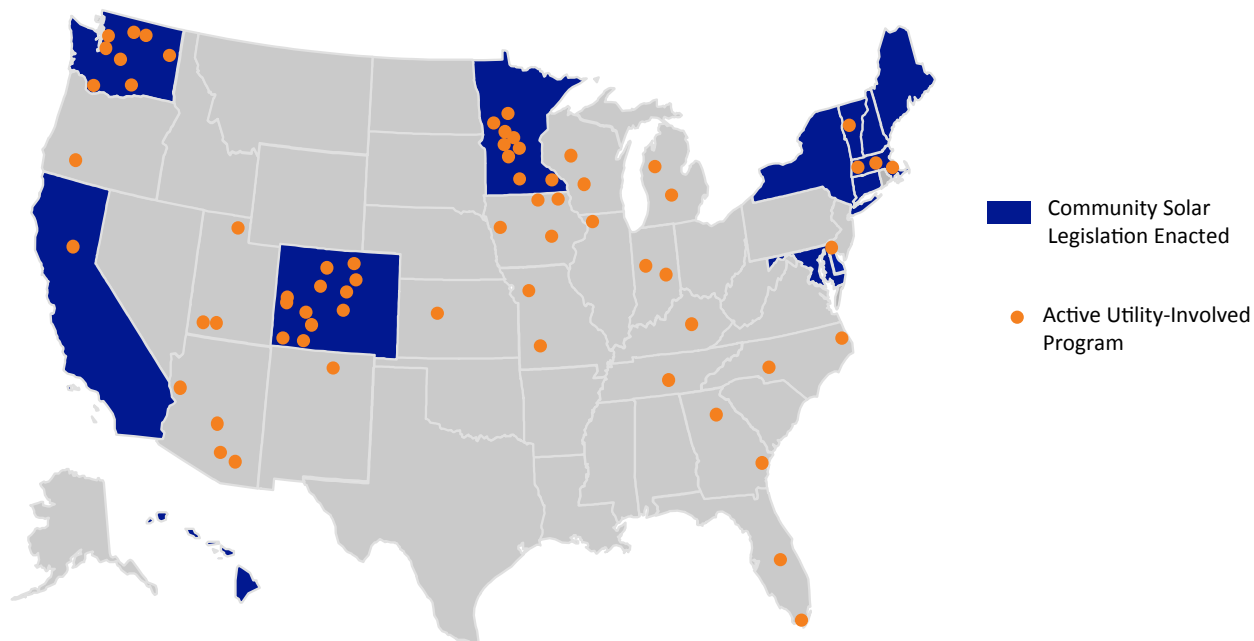
Source: SEPA research

When the first CSPs (also commonly referred to as “solar farms” or “shared solar”) were completed in 2006, they offered participants an opportunity to access solar output without the need to install panels on their homes and businesses. These innovative projects provided solar access to all customers, and in particular those customers who did not own their property, or had roofs that were shaded, were not appropriately oriented for solar collection, were in less than optimal locations for solar panels, or simply for those customers interested in solar but who chose not to host a system on their property. In addition, because of economies of scale, community solar projects provide the opportunity to realize lower installation and maintenance costs, and higher energy production per kilowatt (kW) as compared to individual installations.

These project encompass a wide 68 active CSPs (Figure 2), with many more being planned (the full list of active programs is provided in Appendix A). There are a wide variety of program designs that have experienced varying rates of customer subscription. Research into which design elements and models have worked best will lead to more consistency in CSP design and increased clarity for market participants, and thus easier replicability and improved adoption.

Community solar programs are pursued for a variety of reasons, the most common being as a response to customer demand for more solar options. In addition, many utilities pursue these programs to gain experience in the distributed solar market and to have greater control over the location of distributed solar projects. Another large driver of community solar development is state policy or regulatory direction. As of the time of this report, 13 states plus the District of Columbia have enacted community solar legislation (Figure 3). Each policy varies, particularly in scale and reimbursement rate, but the foundation for each is the enablement of bill crediting for customers participating in community solar programs. These policies, as depicted in Figure 3, have been highly influential in generating community solar programs.

FIGURE 3. GEOGRAPHIC DISTRIBUTION OF COMMUNITY SOLAR PROGRAMS



Source. SEPA research and VoteSolar's sharedrenewables.org website accessed 8/25/2015

Impact of Community Solar State Legislation

Three states have community solar legislation that dates back to 2010 or prior — Colorado, Massachusetts, and Washington. Of the 68 active programs, 24 of them are located in these three states. Impressively 35% of total CSP generation capacity is located in these states — a striking figure given that they account for only 5.2% of total national solar generation capacity combined. This stark difference spotlights the importance of enabling policies for catalyzing the CSP market. The three landmark pieces of legislation are summarized below.

Washington (2005). The Community Renewables Enabling Act provides financial incentives to owners of shared renewable electric systems that are located on community-owned property. Systems are limited to 75 kW and the program was originally capped at 0.25% of a utility's peak demand, increased to 0.5% in 2014.

Massachusetts (2008). The Green Communities Act enabled virtual net metering. Systems are limited to 2 MW and must have 2 or more participants, with at least 50% of each system's capacity going to subscriptions of 25 kW or smaller. Participants' credits roll over indefinitely and can be transferred to another customer in the same utility service territory.

Colorado (2010). The Solar Garden Policy Act defined community solar gardens as solar electric systems less than 2 MW and having at least 10 subscribers who own the electricity generated by the project. These customers are credited the aggregate retail rate minus reasonable charges (to account for transmission and distribution infrastructure) determined by the commission.

SEPA's Community Solar Research

SEPA kicked off work on the SMP grant in early 2015. Joining SEPA on this project is the Shelton Group, a leading marketing communications firm focused exclusively on energy and the environment.¹ A working group of 20 organizations including utilities, solar developers, program implementation companies, state governments, nongovernmental organizations, and consumer advocacy organizations supports the project and provides strategic direction and input (Figure 4). By researching and comparing models, conducting market research and disseminating results to the industry, SEPA and this working group are producing a range of standardized, streamlined, and cost-effective CSP business models that can be easily localized for different regions across the country.

As depicted in Figure 5, the project has three work streams that will be conducted over three years. Firstly, research has been conducted to characterize existing community solar models and analyze design elements that affect the uptake of the CSP. This research has been informed with input from the working group members. In addition, part of this research concerns how CSP models and transactions could be designed to meet different customer and utility value propositions.

Secondly, SEPA, together with the Shelton Group, will conduct consumer market outreach to gain insights on how consumers view CSPs, and vet the most promising models. This market research will cover multiple geographic regions, customer demographics, utility types, and market structures so that the results can be broadly applicable across the country. Based on the results of these focus groups and national surveys, SEPA and the Shelton Group will highlight best practices in identifying and marketing to target participants from various demographic groups.

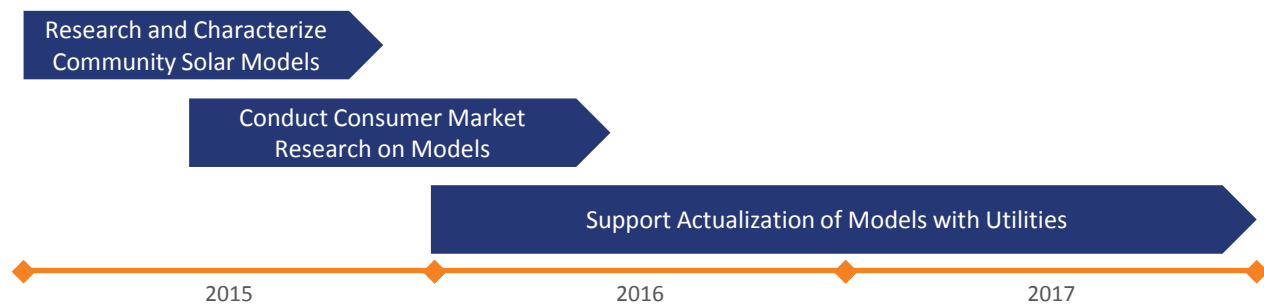
Lastly, SEPA will provide technical assistance to organizations interested in modifying their existing CSP or implementing a new CSP. These organizations will be selected through two open solicitation processes in 2016. The ultimate goal of these technical assistance engagements is to facilitate the installation of at least 4 megawatts (MW) of community solar, leveraging the models and research developed during this process. More information on the final two work streams are provided in Section 5 of this report.

FIGURE 4. SOLAR MARKET PATHWAY WORKING GROUP



¹ More information on the Shelton Group can be found at: <http://sheltongrp.com/>

FIGURE 5. TIMELINE OF SEPA'S SOLAR MARKET PATHWAYS PROJECT



This report is the culmination of the first work stream and is intended to help utility decision makers understand program designs that others have previously explored and to design new CSPs that best suit their organizational goals. The remainder of the report contains the following sections:

- Section 2 discusses the key decision makers involved in CSPs and the implications of different ownership structures.
- Section 3 provides the basics of CSP design, including the standard process, design considerations, and current trends
- Section 4 summarizes the results from a survey of active CSPs. The survey focused primarily on baseline metrics that could be used to measure the average community solar development time, the average CSP capacity utilization, the timeline for consumer adoption of the average capacity utilization, and the residential and nonresidential participation in a CSP.
- Section 5 discusses the next steps of SEPA's SunShot award "Community Solar Design Models for Consumer, Industry & Utility Success."
- Appendix A contains a listing of all active community solar programs in the United States, as of September 2015.
- Appendix B contains the survey instrument SEPA used to gather details discussed in Section 4.

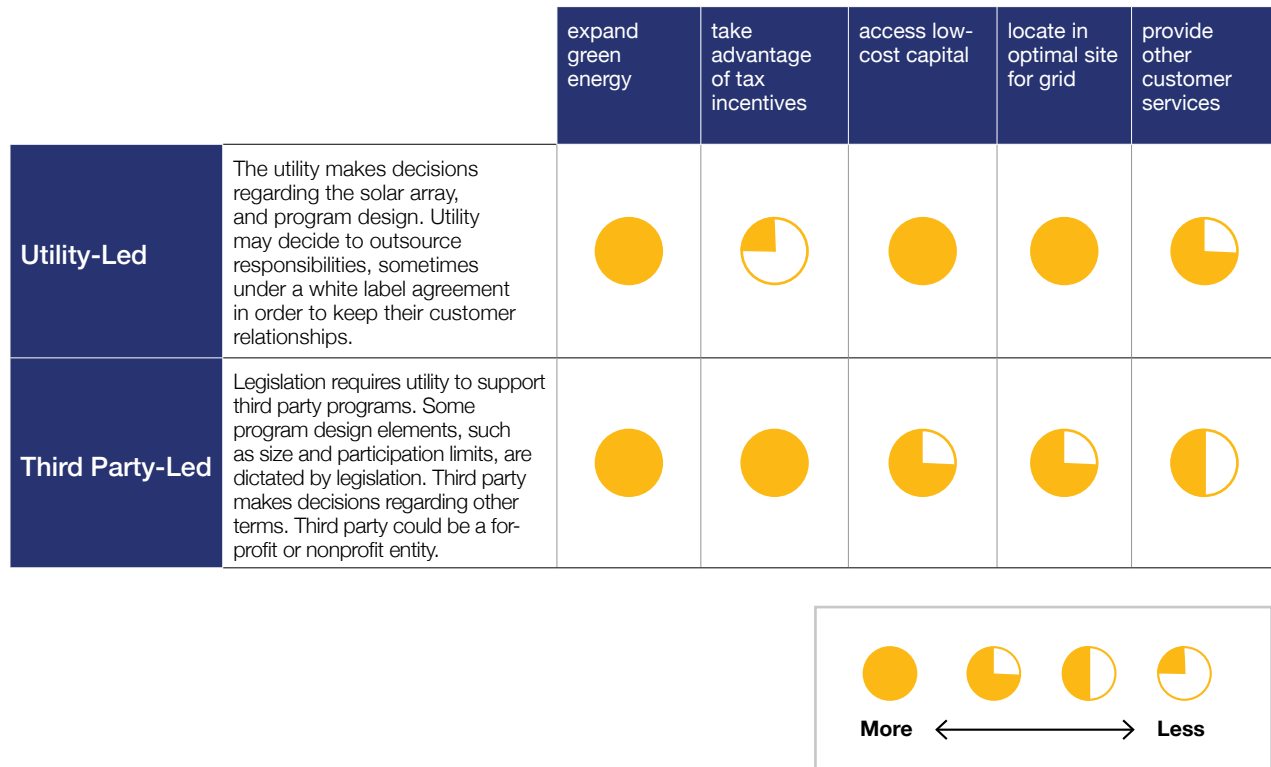
SECTION 2: COMMUNITY SOLAR PROGRAM DECISION MAKER

The primary decision makers, or ownership team, are collectively in charge of the CSP. This team often consists of a program developer, administrator, and utility off-taker, though in many instances one entity, such as the utility itself, will serve multiple roles. The responsibilities of the ownership team include:

1. Site acquisition
2. Financing and accessing available incentives
3. Construction of the CSG
4. Program design (which is discussed in detail in the following sections of this report)
5. Marketing and subscriber recruitment
6. Subscriber billing and crediting
7. Operation and maintenance of the CSG
8. Handling tax and security liabilities

Despite the fact there are multiple roles on the ownership team, there is typically a single key decision maker on any one CSP. Either the project can be 1) utility-led or 2) third-party led and utility-supported. Descriptions and a simple comparison of the two models are provided in Figure 6.

FIGURE 6. OVERVIEW OF UTILITY-LED AND THIRD PARTY-LED CSPS



GUIDE: Comparison is based on SEPA evaluation of existing programs and working group input.

Expand green energy. CSPs, no matter who leads them, all increase the amount of renewable generation and bring solar ownership to entities who otherwise could not do so.

Take advantage of tax incentives. Third parties, since they are primarily for-profits, have taxable income which they can offset by accessing the federal investment tax credit. Utilities, for the most part, can only do so by contracting a third party to develop the program.

Access low-cost capital. Utilities may have access to special federal and state loans through programs such as the U.S. Department of Energy’s Loan Guarantee Program. Third parties rely on traditional capital markets.

Locate in optimal site for grid. Utilities have data on the supply and demand of the grid and can thus be aware of ideal grid locations for distributed generation projects. Third parties can gain this information, but must work through the utility to do so.

Provide other customer services. Utilities are energy organizations not tethered solely to solar and are able to bundle community solar with other services such as demand response and energy efficiency. However, this is a largely untapped market.

SECTION 3: COMMUNITY SOLAR PROGRAM DESIGN

Most readers are interested in how to design a community solar program that meets objectives, responds to local or regional desires, and delivers successful results for all stakeholders. This section presents our method to design a successful program based on an understanding and comparison of existing programs across the nation.

Each community solar program is designed differently, making it a challenge to compare success across programs on an apples-to-apples basis. To create a methodology to define success, SEPA suggests considering whether three criteria are met. They are:

- Is the program fully subscribed?
- Does the program return value to all rate-payers in an economically balanced and equitable manner?
- Are subscribers satisfied with the program?

Based on this evaluation, community solar programs experience highly varying levels of success. For example, the Orlando Utilities Commission (OUC) has, what many consider to be one of the most successful programs. Launched in 2012, OUC was able to fully subscribe its 400 kilowatt (kW) program in under a week. Based on continued demand and positive feedback – there was more than 1 MW of demand on the waiting list in the summer of 2015 – they are currently in the process of expanding their program. In contrast, Florida Keys Electric Cooperative's (FKEC's) Simple Solar program, launched in 2010, struggled in its early stages to get participation, and had less than 10% of the available panels leased as late as 2014.

So the big question is, of the two programs based in Florida why did OUC succeed while FKEC struggled? Though many factors are at play, including the widely different economic conditions in 2010 versus 2012, SEPA has identified a four-step process for program design, which can help utilities ensure the best chance of community solar program success.

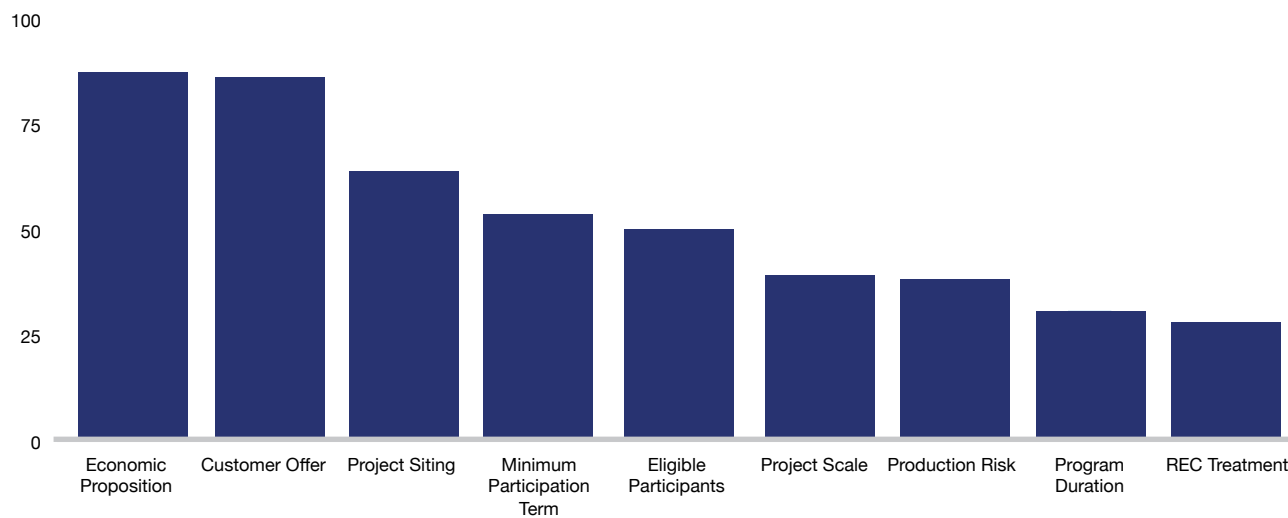
Four Steps to Community Solar Program Success

STEP 1

Identify clear program goals and conduct due diligence on your local market to ascertain whether these goals are feasible.

Commonly cited goals for community solar programs include providing increased renewable energy options for all customers, responding to the expressed needs of a select set of customers highly interested in solar, creating options for customers that compare equitably to rooftop solar, and educating consumers about solar power basics. The goal has an influence on program design. The administrator should look into ways other programs have been designed and speak with other administrators about their design processes. Additionally, it is highly recommended that the administrator hears the customer's voices through focus groups, customer surveys, or open meetings, in an effort to better understand their customers' needs and areas where a program can and cannot make design tradeoffs (e.g., siting in a remote location in order to reduce costs). It is important to frame these discussions in a way that will help indicate actual behavior of the customers or members rather than simply finding out if they like the concept of community solar or of a particular design. The working group identified the elements depicted in Figure 7 as those most in need of customer input. The design options in the horizontal axis are defined and discussed in detail in the following section.

FIGURE 7. RELATIVE IMPORTANCE OF TESTING DESIGN OPTIONS WITH SUBSCRIBERS FROM WORKING GROUP INPUT



STEP 2 Select design options for the community solar program.

At the first working group meeting, SEPA identified 12 design decisions that the administrator must consider when designing a community solar program, excluding those regarding the constitution of the decision team. These design decisions can be broken up into decisions concerning program economics, targeted subscribers, and program flexibility (Figure 8). Each of these 12 key design decisions is discussed further in the following section of this report.

STEP 3 Identify marketing plan.

Early market research suggests that few potential subscribers truly understand the CSP model. Customer education and marketing are a crucial step. There are a variety of ways that a program can be presented to its targeted audience, ranging from traditional advertising to pricing tactics to social media campaigns. The administrators must decide upon the appropriate marketing campaign, and should consider whether they are marketing a single project or a scalable program.

STEP 4 Monitor program satisfaction.

Once the community solar program is running, it is important to have a feedback loop and learn from subscribers what their satisfaction is with the overall program and specific elements. SEPA recommends that, at a minimum, two low-cost tactics be pursued. First, existing customers need a way to provide direct feedback; an email address dedicated to the program satisfies this need. Second, once a program has been fully subscribed, interested customers should be able to sign up for a waiting list. This waiting list will not only reduce the uncertainty regarding any program expansions, but also provides an indirect indication of current subscribers' satisfaction.

Design Decisions

The administrators need to consider at least 12 design decisions when crafting their community solar program. It bears noting that none of these design decisions is made in a vacuum, and they all affect one another. The key design decisions along with the common options used in existing CSPs are summarized in Figure 8 and discussed below.²

FIGURE 8. TYPICAL DESIGN DECISIONS AND OPTIONS

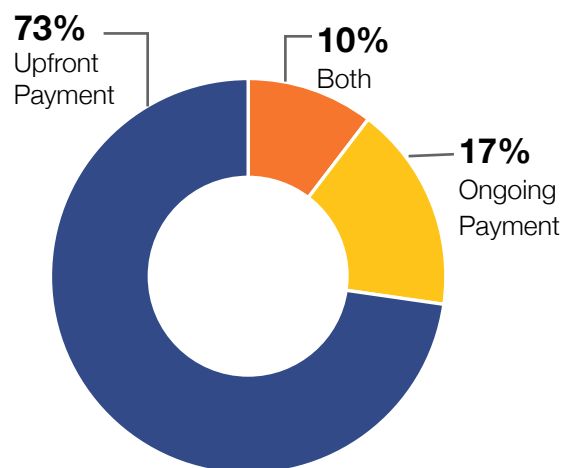
Customer Offer Upfront Payment (\$/W) Ongoing Payment (\$/kWh)	Economic Proposition Bill Credit Line Item Payment	One-Time Sign-Up Fee None Refundable Down Payment
REC Treatment Retired Transferred to Customer Held or Sold to Market	Siting and Scale Community: Small Scale Economically Optimal: Small to Large	Participation Limit: Usage 50% Average Consumption 100% Average Consumption 120% Average Consumption
Participation Limit: Capacity 10% to 50% of CSG capacity	Production Guarantee Variable Output Fixed Output	Minimum Term None 12 months 24 months
Program Length <10 Years 20–25 Years System Life	Subscription Transfers Transferrable Not Transferrable	Unsubscribed Energy Socialized Remarketed Below the Line

Economic Design Decisions

Customer offer: The customer offer is how the subscribers pay to participate in the CSP. There are two typical options. Customers can either provide an upfront payment which covers the entirety of costs associated with the program, or they can subscribe to a rate schedule (or similar vehicle) with an ongoing premium payment applied to the electricity produced by their share of the system. Oftentimes when an upfront payment is offered, financing options will be provided to help defray the initial cost. Of active CSPs, 73% have an upfront payment customer offer, 17% have an ongoing payment, and 10% allow customer choice among the two options.³

With the decline in solar hardware and soft costs over the years, the customer offer cost has steadily decreased on average. Upfront payments averaged approximately \$5 per Watt (W) before 2011, \$3.50 per W in 2013, and \$3 per W in 2015. On-bill payments are not all priced in a consistent manner,

CSP SHARE BY CUSTOMER OFFER



Source: SEPA CSP Database 8/24/15

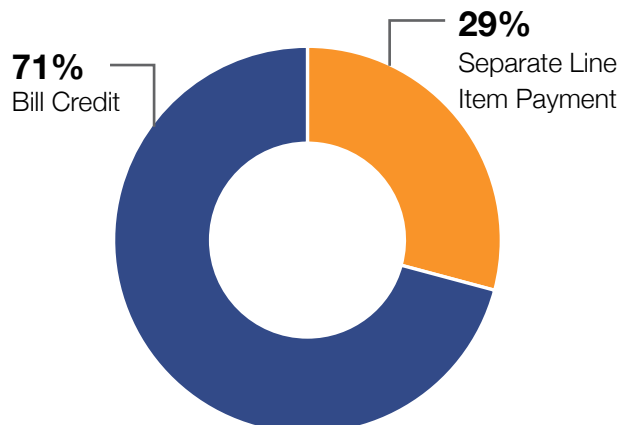
² The common options included in this table are not meant to be all-inclusive, but to serve as indicators of typical decisions seen in programs today.

³ These percentages are based on number of programs and are not weighted by MW or other factors.

some are priced as premiums over individual customers existing rates, while others are priced as fixed rates for all customers. But there is a seeming trend of price decline as well. Cost premiums were typically around 2 cents to 3 center per kilowatt hour (kWh) before 2015.⁴ This year, some programs, most notably SolarPerks administered by the Clean Energy Collective (CEC), are priced below the prevailing retail rate.

Economic Proposition. The economic proposition is the financial value the subscriber receives in return for participating in the CSP. This can take two forms: a bill credit (71% of CSPs), or a separate line item payment (29%). When a bill credit is provided, subscribers' kWh consumption is reduced by the kWh produced by their share of the CSG for specific line items on their electric bill. The separate line item payment is a rate unique to the CSP that is based on avoided costs, value of solar, or another accounting method, and would be applied to all kWh produced by the subscriber's share of the output.

CSP SHARE BY CUSTOMER OFFER



Source: SEPA CSP Database 8/24/15

A key consideration in designing the economic proposition is reducing the utility's administrative burden from a billing perspective. Some utilities implementing community solar programs have encountered major internal hurdles in the form of extra costs for updating a billing system or for other administrative expenses or use of resources. To help overcome that hurdle, some third party providers have made the removal of that administrative burden a major part of their value proposition in working directly with utilities.

Sign-up Fee: Another economic decision is whether to charge a nominal sign-up fee. This fee can be used to guarantee a subscriber's share before the CSG is generating electricity. Of CSPs that currently have fees, they range from \$50 to several hundred dollars. The size of these fees and how they are handled is largely dependent on the customer offer. For CSPs with upfront payment customer offers, it is common to have a higher sign-up fee to reserve a subscriber's share of the CSP before it is energized, which is then applied to the cost of the upfront payment at the time the system is energized. For CSPs with ongoing payments, sign-up fees can be used as insurance against the chance the subscriber leaves the program before the minimum term; however, these fees should not be intended to be used directly to build the system.

Renewable Energy Credit Treatment: In states where renewable energy credits RECs accompany renewable energy production, the owner of the credits will have to evaluate how to handle them. RECs have direct economic value if they are sold on the market; thus, who maintains ownership of them can affect the other economic design decisions. There are two options. In the first option, the owner of the energy can maintain ownership of the REC. In this case, it is then up to the owner whether they retire the REC to meet a compliance requirement or if they sell it on the market. The second option is that the REC can be tied to the energy production and transferred to the customer.

The former option is pursued in a majority of CSPs. Some of the main reasons for this are that few CSP subscribers have sufficient understanding of RECs to monetize them and the value of a single individual's RECs are often outweighed by transactional costs. The project owner can better draw value from the RECs, and in many cases they are able to pass this value on to their subscribers. For example, one of the reasons that the SolarPerks program can offer on-bill payments that are priced below the prevailing rate, is because CEC is able to take advantage of Massachusetts' generous RECs. SRECTrade, Inc values Massachusetts' solar RECs between \$250 and \$460 per MWh. It should be noted that many working group members pointed out that when a REC is not transferred to the customer or retired on behalf of the customer, then the customer is not actually buying solar power. In these cases, CSP owners should be aware of the Federal Trade Commission's guidance that "marketers should not make broad, unqualified renewable energy claims, directly or by implication."

⁴ Often, these premiums are part of a locked-in price, where the customer pays that same amount over a long period of time (e.g., 20 years). Effectively, the customer is receiving a hedge on their energy costs and may see savings over time.

Targeted Subscriber Decisions

Site and Scale: The design decisions of siting and the scale of individual CSGs are intricately linked. Initially, SEPA expected that there may be large demand from customers for siting the program within their community, in a visible location.⁵ This would most emulate the prestige effect of rooftop solar as an indicator of customer values, including environmental and social values. In contradiction to this belief, recent customer feedback suggests that siting in a visible location is not as high of a priority as siting in locations that provide the lowest cost. During focus groups held by the Shelton Group, in August of 2015, a majority of customers voiced a strong desire for siting and scale that provide the lowest costs. It is perhaps in response to this demand that a majority of existing CSGs are located at sites, such as brownfields and utility owned property, which may provide more economic value and convenience to the grid.

Project siting can intrinsically impact the size of each installation. Developing community-based systems may result in smaller projects, as they may be more land constrained. Conversely, siting in more remote locations can allow for much larger projects that take advantage of economies of scale. A third alternative under consideration is locational deployment. This concept is to identify places on the distribution system that could benefit from the addition of local generation. While the systems may be smaller in size (akin to community-based installations), the added benefits from strategic siting could be monetized and passed on to subscribers, making the program more economic.

Participation Limits: Participation limits are implemented to ensure that multiple subscribers can benefit from the CSP. A majority of existing CSPs have at least one of two typical types of participation limits: usage limits and capacity limits. A usage limits caps subscription levels to a certain percentage of the subscriber's average consumption. The cap ranges between 50% and 120% of consumption in existing programs. One of the reasons why these caps are enacted is that allowing subscriptions far beyond an individual's demand makes it more closely resemble an investment security than an electric contract. CSPs with usage limits at the lower end of this range allow for more subscribers to participate in the program; however, the tradeoff to this benefit is that there is also a greater risk of under-subscription.

A capacity limit caps subscription levels to a number of panels or kW, and there are often varying limits for residential and nonresidential subscribers. Capacity limits are often targeted at commercial and industrial subscribers, and are enacted so that these subscribers are unable to take all of a single project.

Program Flexibility Decisions

Production Guarantee: Solar is an intermittent generation resource. The actual output of the community solar system is uncertain and will vary based on time of year and weather factors, and will change over time due to system degradation. This uncertainty is a risk. Administrators need to decide whether they will bear this risk by guaranteeing subscribers a fixed number of kWh output, or if they will pass the risk along to the participant by offering a variable output that is tied to the actual production of the system.⁶ It is important for design purposes to note that a CSP with a guaranteed, fixed number of kWh can never be fully subscribed — a portion of the program's capacity needs to be available in the case that actual production is less than guaranteed production. For a variety of reasons, over 90% of current CSPs provide a variable output tied to actual production.

Many utilities have expressed that without providing a variable output, a CSP would fail to serve one of its chief goals, educating customers about solar power. The flip side of this argument is that providing some guarantee makes the CSP more attractive to risk-averse subscribers.

⁵ For purposes of clarity, "community-based," from a location perspective, is meant to imply physically located inside a specific geographic area and intended (in whole or in part) for participants that reside near the facility.

⁶ Please note, it is assumed that the project owner will make best efforts from an O&M perspective to maintain system availability and maximize production. This category simply suggests that customers can be offered a product that is guaranteed from an output perspective (either over a month, season, or year), or receive the variable output that is common with these types of resources.

Minimum Term: This design decision is only applicable to programs with an on-bill payment customer offer, though not all programs with an on-bill payment need to have a minimum term. Minimum terms are predominantly 12 or 24 months long in existing CSPs. This safeguards against subscribers joining the program during the summer months, when the solar output is highest, and leaving in the winter. You can either enforce a minimum term by having a sign-up fee that is refundable after the term is complete, or by having a penalty for leaving before the end of the term. Because penalties can be difficult to collect, particularly if the subscriber moves from the service territory, the former option is recommended.

Program Length: The program length is the amount of time a subscriber can receive benefits from the CSP. The program length is a commitment by the CSP administrator to the subscriber, not the reverse. Early customer research has shown that it is very important to clearly communicate this. Potential subscribers who misinterpret long program lengths as being their commitment can be quickly scared off from participating in the CSP. The program lengths of existing CSPs vary, but many guarantee the benefits of the transaction for up to 20 to 25 years. Since solar panels have longer lives, this means how the panels will be used after the program length will need to be addressed, although this only needs to be addressed during the CSP design stage if the program length is short. It is highly encouraged that the administrator considers the expected payback period of the program, and design a greater program length so that customers receive a lifetime benefit.

One state that provides some notable exceptions to the typical 20- to 25-year program length is Washington. Washington's Renewable Energy Credit program can provide CSP subscribers up to \$1.08 per kWh produced by their share of a community solar project. These credits are scheduled to last through 2020. For this reason, some of the CSPs in WA, including a program administered by Seattle City Light (SCL), have programs that end in 2020. This corresponds to an eight-year program length for the earliest of SCL's subscribers. Since 2020 is in the near term from a utility resource planning perspective, SCL has already decided that ownership of the solar panels will revert to the host sites after that point.

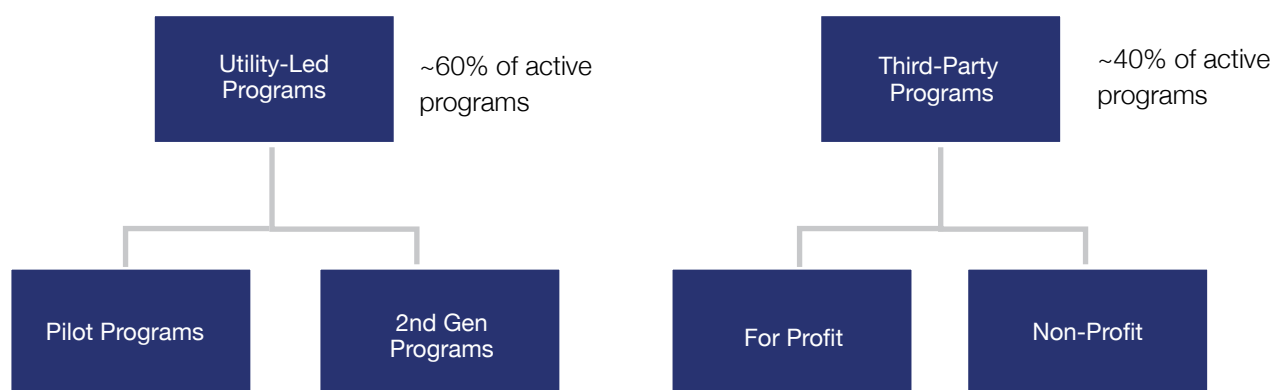
Subscription Transfers: The subscription transfer design decision addresses when subscribers are eligible to pass their subscription to another party and how such transfers are transacted. Allowing subscribers to transfer their subscription at any point provides full flexibility but can cause higher administrative fees. The less-costly option, chosen in most CSPs, is to only allow transfers when a subscriber moves out of the service territory. In the event of a transfer, the burden of finding a new participant can fall on the subscriber or the CSP administrator.

An example of a program that provides maximum flexibility to subscribers seeking to transfer their share is Heartland Power Cooperative's Community Solar Project. Subscribers pay an upfront fee of \$700 at the start of the program, which provides them a 20-year lease to the output of a 315-W solar panel. When they wish to transfer their subscription, Heartland guarantees to buy it back at a prorated price that is provided in the customer agreement. The price declines 5% per year, corresponding to a 20-year linear depreciation of the asset.

Additionally, a tangential consideration is subscription portability. That is, whether a participant can remain on the program if they move residences within the same territory. Allowing for portability provides value to the customer and to the CSP owner, and best practices would suggest that all CSPs address and allow this option.

Unsubscribed Energy: The final design decision is how the costs of any unsubscribed portion of the CSP will be handled. There are three typical ways that CSP owners plan for unsubscribed energy. The utility can "socialize" it, meaning cost recovery for the unsubscribed portion of the system is spread out across all other ratepayers. The energy can be "remarketed," either from the utility to a separate buyer, or for third party-led programs, back to the utility at an avoided cost-rate. Finally, the utility can handle the costs below the line, meaning the costs are effectively unrecovered from a traditional ratemaking perspective.

FIGURE 9. COMMUNITY SOLAR PROGRAM CLASSIFICATION



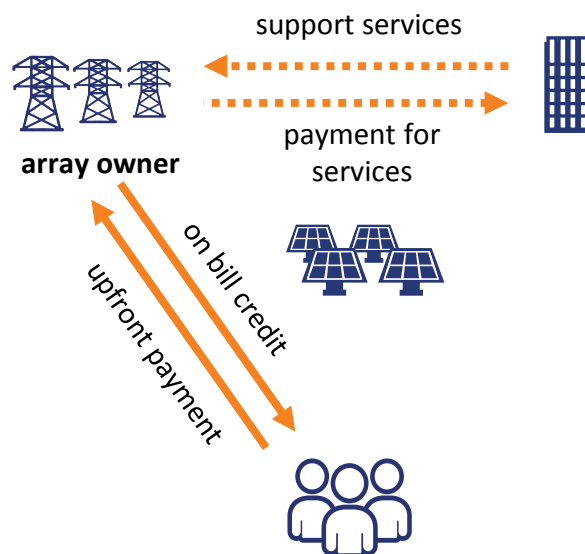
Early Community Solar Program Models

As of August 2015, SEPA was tracking 68 active CSPs across the country, with more announced seemingly every week. The specifics of individual program designs vary, and no standard, off-the-shelf designs exist that can be quickly and confidently replicated.⁷ However, SEPA categorizes all CSPs into two general design categories: they are either utility-led or third party-led. Each of these general categories has at least two subcategories as depicted in Figure 9.

These categories are not meant to be the final word on CSP design structures, but instead simply a method to improve conversation around the types of programs. Simply put, they are a classification of what is, not a decree of what should be. It is likely, as designs evolve, that additional program variations will emerge and SEPA will update these categories. Though the specifics of program designs within each category vary, there are some general consistencies across each bucket which are discussed below.

Utility-Led “Pilot Program”

Pilot programs are a first-step CSP model, driven by the desire to provide solar ownership to the utility’s most environmentally conscientious customers while at the same time providing the utility with experience operating a solar program. These programs are most common in smaller utilities, often cooperatives or public power utilities, and utilities with little experience in solar generation. Because the programs are designed to satisfy the demand of select customers, they are typically small in scale — under 500kW — and are able to have an upfront payment. Some utilities pursuing this model contract specific support services, such as billing or operations and maintenance (O&M), out to third parties.



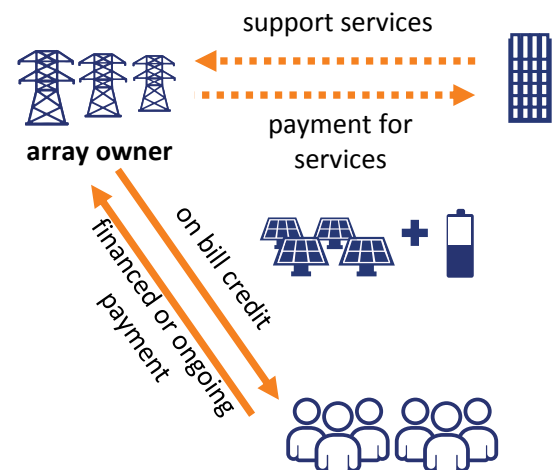
⁷ IREC’s “Model Rules for Shared Renewable Energy Programs” provides a guide of program specifics and provisions to consider in each CSP. Available at: <http://www.irecusa.org/model-rules-for-shared-renewable-energy-programs/>

CASE STUDY: THE CITY OF ELLENSBURG

Ellensburg, Washington launched one of the nation's first CSP pilots in 2006. The municipal utility owns and runs the program. The program is relatively small in scale. It started with a 36 kW CSG and has grown to a total capacity of about 112 kW after two expansions. The program generates enough energy to fulfill the entire needs of only about 30 residential participants. Because the number of participants is relatively small, the program was able to charge an upfront cost of approximately \$7 per Watt (which was in line with solar costs at the time of the project). Subscribers are credited at the local wholesale rate for all electric production from their share, and own the rights to the environmental attributes associated.

Utility-Led “Second Generation Program”

Recently, utilities have shifted focus from satisfying the needs of select customers to bringing the opportunity of solar ownership to the entire breadth of their customer base and making distributed energy resources part of the smart grid story. The programs that have resulted are larger in scale, with some programs more than 20 MW. So that the program is not financially cumbersome and accessible to customers from all economic backgrounds, these programs provide customers the option to spread out their payments either through attractive financing or per kWh, ongoing payment options. In addition, some utilities have begun to add companion measures, such as storage, to their CSGs, in order to enhance the programs' overall value to the grid. Again, some utilities pursuing this model may contract with third parties for specific support services, such as billing and O&M.

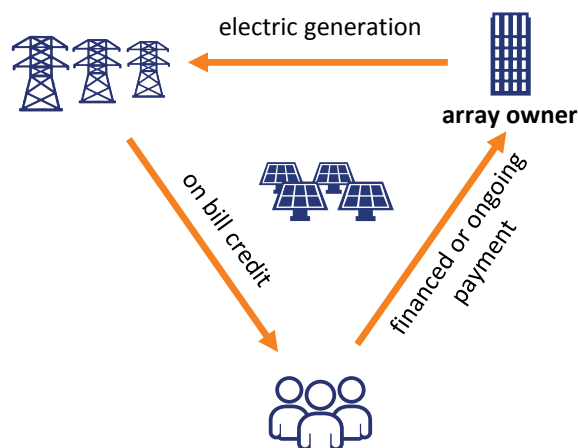


CASE STUDY: THE SUNNA PROJECT

Steele Waseca Electric Cooperative's (SWCE's) community solar program, the Sunna Project, has a capacity of 102.5 kW and was designed, developed and owned by the utility. Subscribers can participate by paying an upfront fee of \$1,225 for 20 years of output from a 410-W panel. These design options make for what would be considered a very prototypical simple pilot CSP. Interestingly, SWCE created a variation that allows subscribers to bundle their community solar participation with a demand response program. With this option, the participant receives a free, 16-hour storage water heater and a \$1,055 discount from the upfront cost of the first solar panel. SWCE recoups these investments through additional electric sales from the water heating and the savings on wholesale power costs by shifting purchases dedicated to water heating to off-peak hours.

Third Party-Led “For Profit Program”

In the late 2000s, private companies entered the community solar market. The companies — three of which (Clean Energy Collective, Recurrent Energy, and Sunshare) are on our working group — partner with utilities to develop, manage and maintain community solar programs. Private company-led programs have proliferated most rapidly in states with shared solar policies. Because they are profit driven, these programs are designed to maximize participation, thus the CSGs are usually large, often greater than 1 MW, and multiple pricing options are provided to appeal to the broadest audience. These companies often provide their services to utility-led programs as well, though this is a separate classification.

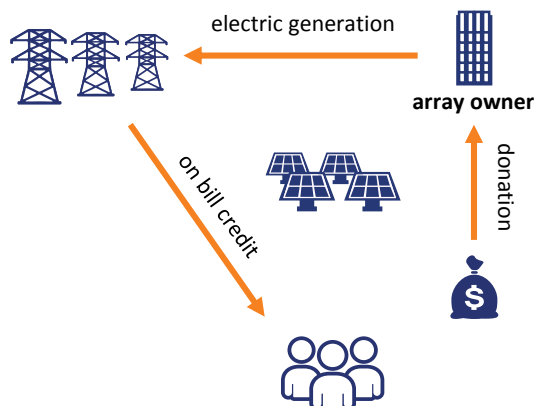


CASE STUDY: XCEL ENERGY

Xcel Energy has community solar projects totaling almost 20 MW in its Colorado service territory. Xcel's Solar*Rewards Community projects are constructed and owned entirely by private companies. These projects have enjoyed rapid growth and are usually fully subscribed within 6 months of coming online. Xcel selects its for-profit partners through a competitive bidding process and pays them subsidies tied to the amount of electricity generated. Early in the program, participants paid an upfront fee based on their subscription size, however financing is now available to most subscribers.

Third Party-Led “Nonprofit Program”

Though less common, some CSPs are led by nonprofit organizations. Some nonprofits are formed specifically to manage a specific community solar program and are wholly owned by subscribers to the program; some are mission based organizations that are supported by donations. These programs are notable in that they have had early success in developing CSP models that involve low-income subscribers.



CASE STUDY: GRAND VALLEY POWER AND GRID ALTERNATIVES

In 2015, Grand Valley Power (GVP) partnered with GRID Alternatives (GRID) to build a 24 kW CSG. The system was dedicated specifically to low-income customers in GVP's service territory and is operated and managed by GRID. GRID, a nonprofit, promotes a CS model that involves combining equipment donations from solar manufacturers, financial contributions from various sources, and labor from job training programs and volunteers. Subscribers to the program pay no up-front fee and receive an ongoing credit for the production of their share of the CSG, though there is a 2 cent per kWh fee to help defray management costs. Subscribers participate in four-year cycles. After each cycle, they can requalify for the program, or if they no longer qualify — for example, if their income has risen above program limits — their share can be assigned to another low-income participant.

SECTION 4: COMMUNITY SOLAR PROGRAM BASELINE SURVEY

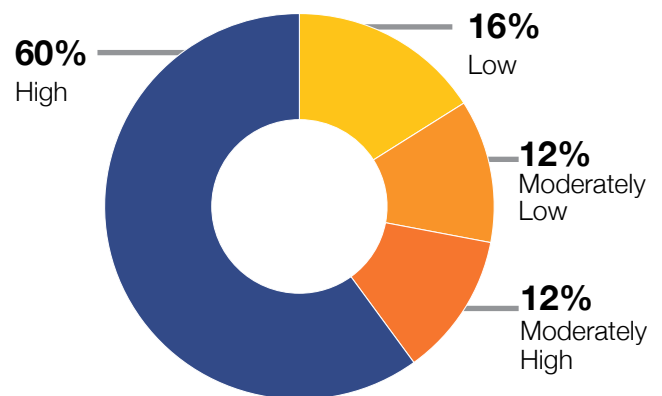
One objective of SEPA's research is to develop metrics for assessing the performance of existing community solar programs in order to verify that the research project is (1) increasing the average CSP capacity subscription rate; (2) shortening the timeline for consumer adoption of the average capacity subscription; (3) increasing the nonresidential participation in CSP; and (4) shortening the average community solar program development time.

In August of 2015, SEPA surveyed administrators at all of the 68 active community solar programs it is tracking in order to collect those baseline metrics. Where possible, results from the survey have been compared to results from SEPA's 2014 study, "Expanding Solar Access Through Utility-led Community Solar." The actual survey instrument used is provided in Appendix B. A total of 25 CSPs, which corresponds to more than one third of active programs at the time of the survey, participated in this survey.

What are CSP Subscription Rates?

- On average, CSPs are subscribed at 70% of available capacity. This value is the same as was found in 2014.
- The subscription range has significant variation. One program had only a 3-percent subscription rate, and eight of the programs surveyed had 100-percent subscription.
- The variation of subscription rates between programs with ongoing payments and those with up-front payments was not statistically significant.
- There doesn't seem to be a single silver bullet to ensure a high subscription rate. The survey data shows little evidence that subscription rates are affected by the length of the program or its payback. SEPA also tested the effect of payment types, program size, customer cost, and marketing budgets on subscription rates. Although not depicted graphically, no meaningful correlations were found.
- Programs that reached 100-percent subscription did so quickly. On average, it took CSPs six months to reach 100 percent; however nearly 30 percent of these programs were fully subscribed before their CSGs were energized.

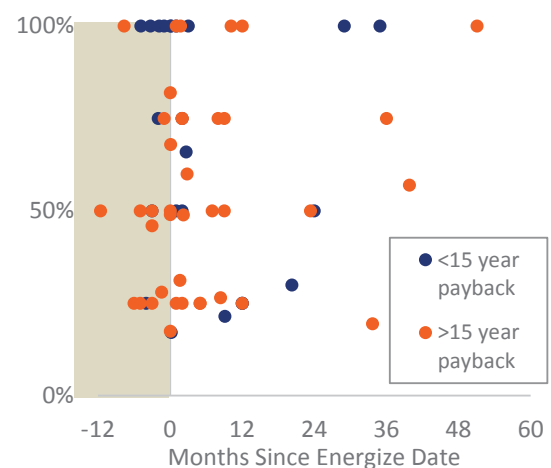
CSP SUBSCRIPTION RATES



Mean CSP Subscription of **70%** Median CSP Subscription of **80%**

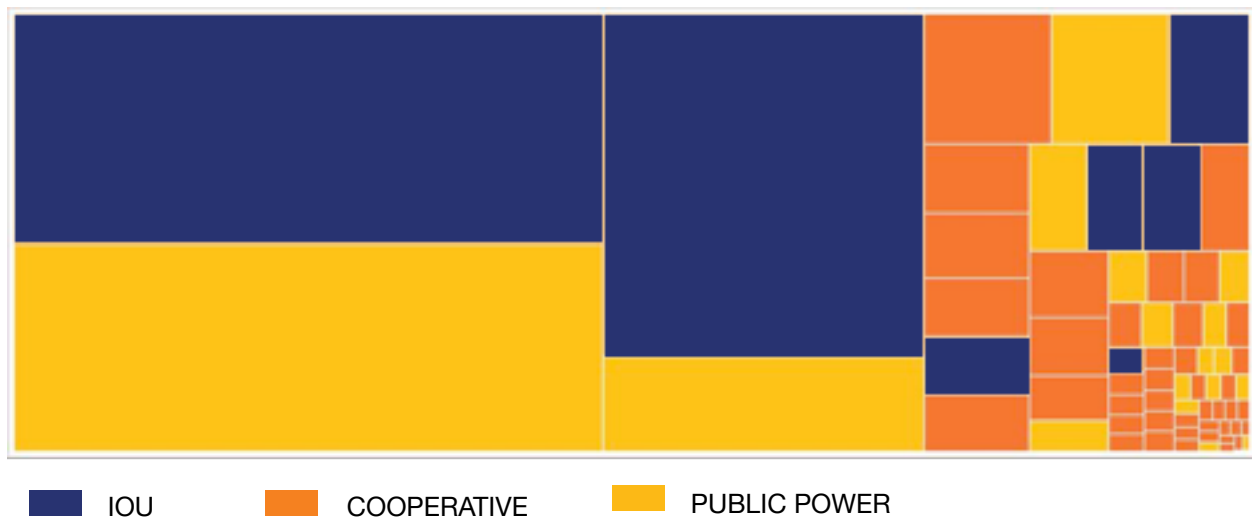
75–100% 50–74% 25–49% <25%

CSP SUBSCRIPTION RATES OVER TIME



What Are the Generating Capacities of CSPs?

88 MW TOTAL

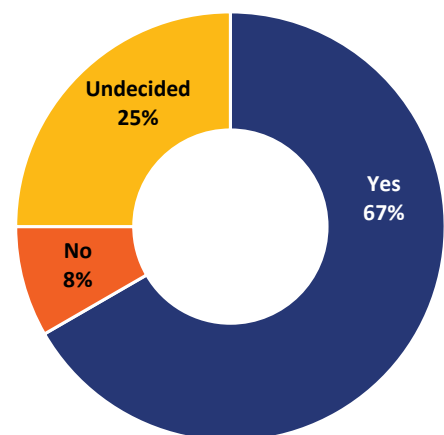


- There was approximately 88 MW of total CSP generating capacity at the time of this report. Of the active CSPs, over 80 percent are under 1 MW.
- Of the total generating capacity, 87 percent is subscribed by residential customers and 13 percent is subscribed by commercial customers.
- On average, a residential participant subscribed to the energy output of 1.5 kW while a commercial participant subscribed to the energy output of 34 kW.

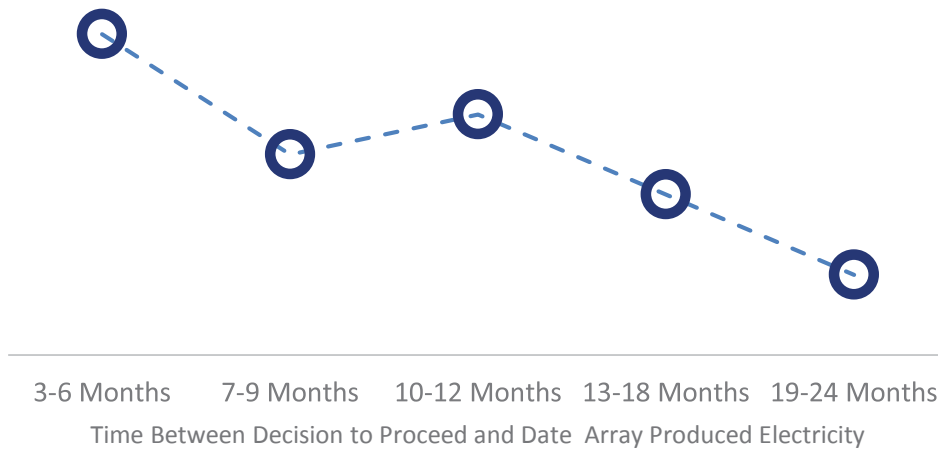
Are CSPs Planning Future Expansions?

- Most programs plan to construct additional CSGs in order to keep pace with growing demand. Two-thirds of the surveyed utilities are planning expansions.
- SEPA has tracked press releases from 52 additional utilities announcing plans to launch CSPs in the upcoming 12 months. These planned programs have a cumulative capacity of more than 200 MW — over double the current total installed capacity. It is important to note that this figure only represents for programs that have publicly announced their plans, and not all announcements included expected program size, suggesting that these values are on the conservative end.

CSP EXPANSION PLANS

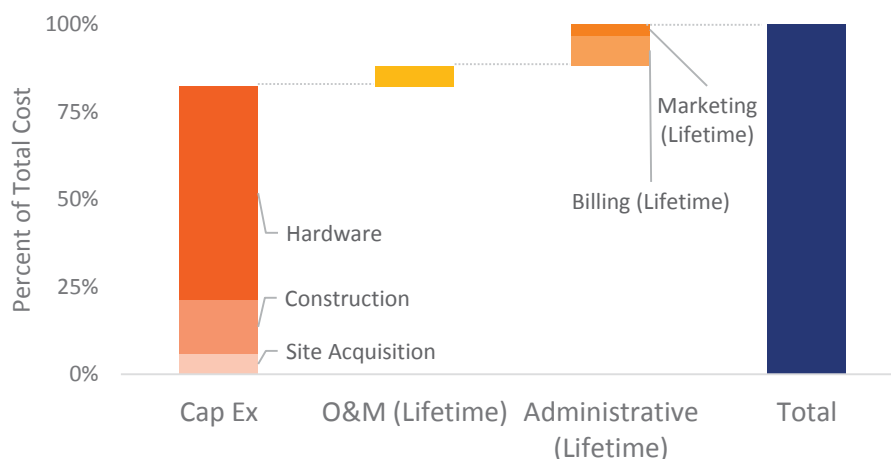


How Long Does it Take to Develop CSPs?



- On average, 10 months elapsed between the time an organization decided to develop a CSP and the actual date the CSG began producing electricity.
- This development time varied based on the size of the CSP — the time for programs with less than 1 MW of capacity was 8.5 months, while the average development time for programs more than 1MW of capacity was 13.4 months.
- The shortest development time was 3 months. The longest period was 24 months.

What Were the Major CSP Costs?⁸



- A majority of costs associated with a CSP are the hardware costs (i.e., solar panels, inverters) and construction of the CSG. The average total cost of surveyed programs was \$4.76 per Watt, though this is not presented in the graphic since the numbers vary largely depending on the year of each program's inception
- Annual ongoing costs — such as operations and maintenance, marketing, and billing — make up approximately 15% of the total CSP budget over the life of the program.

⁸ O&M and administrative costs are incurred annually. In order to compare them to cap ex costs, SEPA converted them to lifetime costs by assuming O&M and billing costs are incurred each year for 20 years and marketing is incurred for first three years.

SECTION 5: NEXT STEPS

As discussed in Section 1, this project is comprised of three distinct work streams. This report is the completion of the first work stream, which involved researching existing CSPs and identifying design trends and standard design models. The next steps for this project are to conduct customer research to determine potential subscriber preferences, and to assist utilities with design and implementation of new CSPs.

In August of 2015, SEPA and the Shelton Group kicked off the second work stream by conducting focus group sessions with home owners, renters, and small business owners in four markets: New Jersey, Colorado, Illinois, and Georgia. Though the full focus group report will not be released until 2016, a few interesting findings can be mentioned at this point:

- **Economics are No. 1** – Customers said that they would only participate if there was a clear economic case for them. The voice of the advocate who puts “being green” above all else was nonexistent.
- **Greater effort is needed to educate the public** – Very few focus group participants knew what community solar was prior to the meeting. This was not due to screening. As the business model was explained, preferences shifted quickly from doubt to interest.
- **Length of commitment must be short** – Customers were not interested in making a long-term contractual commitment. They gravitated toward the models that had shorter terms, provided transferability of subscriptions, or gave flexibility to drop out. Note that the design option for program length, which is typically 20-25 years, is not a customer commitment, but instead a length of time that benefits can be received.
- **Location is important, but in an unexpected way** – There was consensus that customers did not want to see the solar panels and would prefer them to be sited at remote locations. One residential focus group participant likened solar panels to other utility equipment such as substations, which were seen as unattractive, as a reason for preferring remotely located projects to those within their community.

A broader survey, distributed to more than 5,000 individuals across the U.S. is being planned for late 2015. The findings of this survey will be tested against these earlier findings and delve deeper into what trade-offs subscribers are most willing to make, and what design elements are deal breakers. A final report summarizing all findings from this work stream will be provided in early 2016.

At that point, SEPA will begin the third and final work stream, during which technical assistance will be provided to eight utilities seeking to develop CSPs. This work stream will commence in 2016 and run through the end of 2017. The effort will be concentrated on applying the lessons learned in the first two work streams to real world installations.

APPENDIX A

Existing Community Solar Programs

Utility	Program Name	Online Year	Utility Type	State	Program Size (kW)
Benton PUD	Ely Project	2015	Public Power	WA	75
Berea Municipal Utilities	City of Berea Municipal Utilities Berea Solar Farm	2014	Public Power	KY	59
Cherryland Electric Cooperative	Solar Up North (Sun) Alliance	2014	Co-op	MI	53
City of Ashland (Ashland Municipal Utilities)	Solar Pioneer II	pre-2011	Public Power	OR	64
City of Ellensburg	Community Solar Project	pre-2011	Public Power	WA	58
City Utilities (Springfield, MO)	CU Solar Initiative	2014	Public Power	MO	4,950
Clark Public Utilities	Clark PUD Community Solar Program	2015	Public Power	WA	319
Coastal Electric Cooperative	Renewables Solar Farm	pre-2011	Co-op	GA	2
Colorado Springs Utilities	Colorado Springs Community Solar Garden	2014	Public Power	CO	2,497
Connexus Energy	SolarWise	2014	Co-op	MN	246
Delta Montrose Electric Association	Community Solar Array Program	2011	Co-op	CO	20
Duck River Electric Cooperative	DREMC Solar Farm (TVA Generation Partner Program)	2012	Co-op	TN	26
Eau Claire Energy Co-op	MemberSolar	2015	Co-op	WI	872
Empire Electric Association	Solar Assist Cooperative Garden	2011	Co-op	CO	20
Farmers Electric Co-op	FEC Community Solar Garden	2011	Co-op	IA	40
Flathead Electric Co-op	Solar Utility Network	2015	Co-op	MT	104
Florida Keys Electric Co-op	Simple Solar Program	pre-2011	Co-op	FL	118
Grand Valley Power	Grand Valley Power Solar Farm	2011	Co-op	CO	21
Grand Valley Power	GRID Alternatives Solar Garden	2015	Co-op	CO	29
Green Mountain Power	Putney Solar Array	2013	IOU	VT	144
Hawkeye REC	Renewable Rays	2014	Co-op	IA	25
Heartland Power Cooperative	Heartland Power Community Solar	2015	Co-op	IA	852
Holy Cross Energy	Holy Cross Energy Community-Owned Solar Farm	pre-2011	Co-op	CO	2,728

Utility	Program Name	Online Year	Utility Type	State	Program Size (kW)
HomeWorks Tri-County Electric Cooperative	HomeWorks Community Solar Garden	2014	Co-op	MI	21
Inland Power & Light Company	Inland Power & Light Community Solar	2014	Co-op	WA	49
Itasca-Mantrap	SolarWise	2015	Co-op	MN	46
Jo-Carroll Energy	South View Solar Farm	2015	Co-op	IL	127
Kandiyohi Power Cooperative	Kandiyohi Power Community Solar	2014	Co-op	MN	42
Kit Carson Electric Cooperative	Taos Charter School	2012	Co-op	NM	99
La Plata Electric Association, Inc.	Community Solar Garden	2014	Co-op	CO	1,025
Lake Region Electric Co-op	HQ Paire	2013	Co-op	MN	39
Logan Light and Power	Solar Rate	2015	Public Power	UT	19
Mason County PUD 3		2015	Public Power	WA	75
McLeod Cooperative	McLeod Co-op Power's Solar Community	2015	Co-op	MN	41
Midwest Energy	Midwest Energy Community Solar	2015	Co-op	KS	1,209
National Grid / NSTAR	SolarPerks	2014	IOU	MA	996
Newark Electric Department	McKees Solar Park	2014	Public Power	DE	230
NineStar Connect	Willow Branch Solar Farm	2015	Co-op	IN	100
NRG Energy		2015	IOU	MA	1,000
Okanogan County Electric Co-op	OCEC Community Solar Project & Winthrop Community Solar Project	pre-2011	Co-op	WA	43
Okanogan County Public Utility District	Twispworks	2012	Public Power	WA	35
Orlando Utilities Commission	Community Solar	2013	Public Power	FL	400
Pee Dee EMC	Pee Dee Solar	2015	Co-op	NC	100
Platte-Clay Electric Cooperative	Platte-Clay Electric Solar Farm Phase I	2015	Co-op	MO	171
Poudre Valley Rural Electric Association	Community Solar Farms	2012	Co-op	CO	748
Puget Sound Energy	Bainbridge City Hall Community Solar	2012	Public Power	WA	71
Roanoke Electric Cooperative	Community Solar	2015	Co-op	NC	113
Sacramento Municipal Utility District	SolarShares Program	pre-2011	Public Power	CA	1,000

Utility	Program Name	Online Year	Utility Type	State	Program Size (kW)
Salt River Project	SRP Community Solar	2011	Public Power	AZ	20,000
San Miguel Power Association	Paradox Valley Solar Array	2012	Co-op	CO	1,124
Seattle City Light	Seattle Community Solar	2012	Public Power	WA	174
St. Croix Electric Cooperative	St. Croix Sunflower 1	2014	Co-op	WI	103
St. George Energy Services Department / Dixie Escalante Electric	SunSmart	pre-2011	Public Power	UT	250
Stearns Electric Association	SolarWise	2015	Co-op	MN	21
Steele-Waseca Cooperative Electric	SolarWise	2015	Co-op	MN	103
Tipmont REMC	Tipmont REC	2014	Co-op	IN	98
Trico Electric Cooperative	Sunwatts Renewable Energy Program	2011	Co-op	AZ	227
Tri-County Electric Cooperative	Renewable Rays Program	2014	Co-op	MN	74
Tucson Electric Power	TEP Bright Tucson Community Solar	2011	IOU	AZ	22,300
UniSource Energy Services	UNS Electric Bright Arizona Community Solar Program	2012	IOU	AZ	1,720
United Power	United Power SOL Partners	pre-2011	Co-op	CO	35
Vernon Electric Cooperative	Vernon Electric Co-Op Community Solar Farm	2014	Co-op	WI	305
Walton EMC	Cooperative Solar	2015	Co-op	GA	1,000
Western Iowa Power Cooperative	Community Solar	2015	Co-op	IA	308
Western Massachussetts Electric Company (Eversource)	SolarPerks	2014	IOU	MA	997
Wright-Hennepin Cooperative	Wright-Hennepin Co-Op Solar Community	2013	Co-op	MN	62
Xcel Energy CO	Xcel CO Solar*Rewards Community	2012	IOU	CO	18,000
Yampa Valley Electric Association	Yampa Valley Community Solar Array	2015	Co-op	CO	579

APPENDIX B

Community Solar 2015 Survey

1. What is your community solar program's current percent subscription rate (capacity subscribed Watts / total capacity Watts)? If your program has multiple phases, please provide the rate for the latest phase open for subscription and list each phase's subscription in the comments section. *

Comments

2. What is your community solar programs total percent subscription rate, including all phases of the community solar program? If your community solar program only has 1 phase then this answer is the same as the answer to question #1. *

Comments

3. To the best of your knowledge, what is the average subscription size in kiloWatts for subscribers?

Residential Subscribers

Commercial/Industrial Subscribers

4. How does a subscriber benefit from your community solar program?

- ☐ Virtual NEM - kWh produced by subscribed array are deducted from the customer's bill
- ☐ Partial Rate Offset - kWh produced by subscribed array are deducted from specific line items on bill
- ☐ Separate Line Item Payment - a payment based on the avoided costs, PPA rate, or other, is applied to all kWh produced by subscribed array
- ☐ Other - Write In

5. To the best of your knowledge how many months from the energize date did the first phase take to reach the following subscription rates, if applicable?

*If the program reached the subscription rate before the energize date, please select a negative value.

*If the current program subscription rate is less than any of the listed options below, please select "Not Applicable". *

To reach
subscription
rate of
25%

☐ Not
Applicable

To reach
subscription
rate of
50%

☐ Not
Applicable

To reach
subscription
rate of
75%

☐ Not
Applicable

To reach
subscription
rate of
100%

☐ Not
Applicable

6. If your program has multiple phases, to the best of your knowledge how many months from the energize date did the most current phase take to reach the following subscription rates?

*If the program reached the subscription rate before the energize date, please select a negative value.

*If the current program subscription rate is less than any of the listed options below, please select "Not Applicable".

To reach
subscription
rate of
25%

☐ Not
Applicable

To reach
subscription
rate of
50%

☐ Not
Applicable

To reach
subscription
rate of
75%

☐ Not
Applicable

To reach
subscription
rate of
100%

☐ Not
Applicable

7. Of the subscribed capacity, what percent is subscribed by residential customers? *

8. To the best of your knowledge, how many months lapsed between the decision of your organization to proceed with a community solar program and when the solar array was energized? *

9. At the onset of your community solar program, how much did you spend on the following development costs? If you did not construct your community solar array, please just note this in the comment.

	Capital Cost (\$)
Site Acquisition	<input type="text"/>
Construction	<input type="text"/>
Hardware (panels, inverters, balance of system)	<input type="text"/>
Other	<input type="text"/>

Comments

10. How much do you spend annually on or have budget for the following administrative costs? If a 3rd party administers your program please note this in the comment.

	Annual Cost (\$)
Billing	<input type="text"/>
Financing (cost of debt)	<input type="text"/>
Array Operations & Maintenance	<input type="text"/>
Marketing & Customer Acquisition	<input type="text"/>
Other Administrative Costs	<input type="text"/>

Comments

11. What media tactics have you used to market your program to potential subscribers (check all that apply)?

- ☐ Newspaper
- ☐ Mailer
- ☐ On-bill Message
- ☐ Social Media
- ☐ Email
- ☐ Radio Spot
- ☐ TV Spot
- ☐ Web

☐ Other - Write In

12. What are the key messages you have conveyed to potential subscribers when marketing your program (select only the top 3)?

- ☐ It can save you money
- ☐ No maintenance involved
- ☐ Promotes renewable energy
- ☐ Panels are not on your roof
- ☐ Energy generation is local
- ☐ Works for all homeowners and renters
- ☐ Promotes jobs and local economy
- ☐ Other - Write In

13. Do you have plans to expand the community solar program? Please provide additional details below including your expected time frame and capacity for any expansions.

- ☐ Yes
- ☐ No
- ☐ Undecided

Comments